- - -

Architecture Machine Sketch pad
Computer CAD
Aided Drafting
Object-Oriented Graphics Raster Graphics
Building
BIM Information Modeling
BIM Intelligent Objects
Data Base
BIM

3D Virtual Model

CAD BIM

BIM

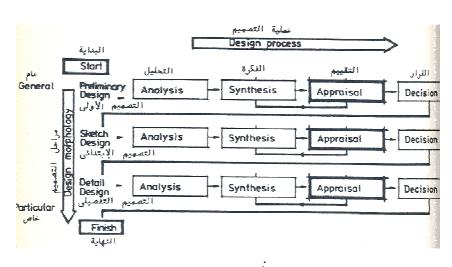
ABSTRACT

The use of computers in the design process depends on the level of development of software that used in the performance of activities in the design process, drawing is perhaps the most important of these activities, digital drawing applications emerged in the beginning of the sixties of the last century, with the emergence of Sketch pad and Architecture, then CAD applications the most famous one in the world of digital drawing are emerged, which is an acronym for Computer-Aided Drafting, those applications had developed to other type of applications that called Graphics Raster, then Object-Oriented Graphics applications, which opened the way for the emergence of a new style of applications to help in the process of drawing that called Building Information modeling internationally known acronym BIM, BIM changed the way of drawing from just point, lines and polygons, to a group of intelligent objects, that means all of the objects that used in BIM applications are architectural objects, consists of a large data base with all information needed to this object, such as object material, finish, acoustics insulation and dimension, by this way, the process of drawing a building using BIM applications done through building complete 3D virtual model, consists of all architecture, structure, mechanical and electrical objects, that led to more productive efficacy in the design process, such as working drawings, table of opening, BOQs and construction time schedules, BIM applications are totally different from CAD applications, Because CAD applications are only drawing applications, but BIM application are complete model of

application that can drive with its Possibilities all the stages of the productive dimension in the design process.

CAD CAD **Building Information** BIM . Modelling (Jones 1980) (Operation Research) (.(Jones 1963) (Archer 1965) (Matchet 1968) (Gero & Roseman 1986) (Gerhard Schmitt 1988) -RIBA **RIBA**

.(RIBA 1973)



Decision RIBA	Making		()		
:	(Markus & Maver 1969)					
			<u>:Ana</u>	alysis	•	
Form G	Generation		:Synth	nesis	•	
.i oim o	eneration	Ciution	<u>:Ap</u>	praisal	•	
			:Decisio	on	•	
المطروحة سابقا	, تصنيف RIBA، وقد قس	اغة الرأسية في ي للعملية التص ي مجموعة الحل و تطوير للحل ا	۱) أن البعد الثاني من الد ة، وهو ما يوازي الصد Ma) مراحل البعد الإنتاج Primary Design: وه Sketch Design: وه	الى مباني حقيقيا rkus & Mave التصميم الأولي ا التصميم الابتدائي	يقول أشر القرارات	
BPM			ت المباني	ات نمذجة معلوماه BIM	٣. تطبيق	
Chales Eastman		Building Production Modelling				
Bernstein . (Eastma	n 1999)	BIM	(Laiserin 2003))		
.ArchiCAD		Graphis	Bentley – Autod oft E	lesk – Grap BIM	hisoft	
	Object-Oriented	d Graphic	s Raster Grap	ohics		
Not Programs Raster	Graphics		,	Joston Bro	aromo	
Dots Bit-map			`	√ector Proo	jianis	
Paint Programs				FIXEIS		
Object-Oriented				(webopedia	.com)	
e e e e e e e e e e e e e e e e e e e	Vector	Graphics	Mathematical		grams	
		Da	atabase			

لمك يكن متاحا في النوع الأول من التطبيقات، كما

تمتاز تلك التطبيقات بعرض الأشكال الهندسية بجودة أعلى ودقة أكبر من تلك الناتجة من تطبيقات Raster Graphics Programs، وتشتهر تلك التطبيقات باسم webopedia.com) Draw Programs).

Building Information Modelling

(Eastman 2006)

Simulation

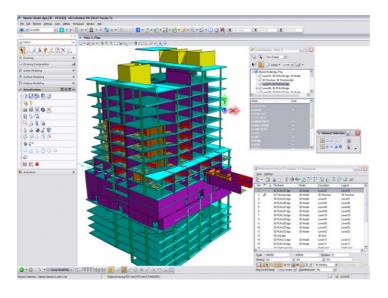
. (Holness 2008)

BIM

BIM

(Clash Detection)

. (The Foundation of Wall and Ceiling Industry 2009)



الشكل ٢: بناء النموذج التخيلي BIM ووضع كافة العناصر المعمارية فيه

BIM

)

(The Foundation of Wall

.and Ceiling Industry 2009)

BIM cad

(

CAD

CAD

.(Oppenheimer 2008)

(

CAD-Drafters

ثم جاءت تطبيقات BIM لتكسب الخطوط صفة الذكاء Intelligence، وتخلق مزيدا من التفاعل بين المصمم ولوحة الرسم الرقمية، وعلى عكس أنظمة CAD تم تزويد تطبيقات BIM بالعناصر المعمارية اللازمة لإنتاج وبناء النموذج التخيلي للتصميم

CAD

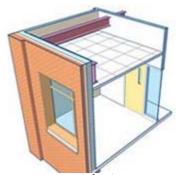
Parameters Object BIM

Material

BIM BIM

CAD

.(Howell 2005)



شكل ٣ غرفة مرسومة باستخدام BIM ويظهر فيها عناصر الإنشاء والفتحات والحوائط والخامات

7. دور نموذج BIM في البعد الإنتاجي للعملية التصميمية CAD

CAD

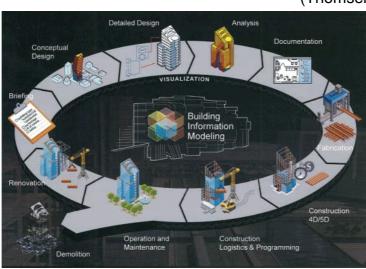
CAD

CAD

CAD

(BIM Model) BIM

(Thomsen 2012) .



شكل ٤ خصائص النموذج الثلاثي الأبعاد

Primary Design



شكل ٥ مشروع Ocean Heights المصمم من خلال Parametric Engine في برنامج Revit

3D BIM

Modellers

BIM

Parametric Design Parametric Engine

Revit Autodesk Parametric

Scripting Algorithms
Language

Ocean Heights

(Autodesk 2007)

Sketch Design المرحلة الثانية: التصميم الابتدائي ٢.٤.٣

BIM

BIM

(The Foundation of Wall and

.Ceiling Industry 2009)

:Daysim

DOE :Energy Plus

:Apachesim

٣.٤.٣ المرحلة الثالثة: التصميم التفصيلي Detailed Design

BIM BIM

أ- دمج البرمجيات الخاصة

(Plugged-In)

(Thomsen 2012).

LEED

The Leadership in Energy and Environmental Design U.S Green Building

LEED

Council

(Great River Energy 2009) .

ب-إصدار التقارير

BIM

CAD

BIM

(Thomsen .

2012)

جـ نماذج البعد الرابع 4D والبعد الخامس 5D

BIM

(Animation)

BIM

BIM

(Thomsen 2012)



شكل ٦ -محاكاة عملية التنفيذ (البعد الرابع والخامس)

د الكشف عن التداخل بين الأنظمة

CAD

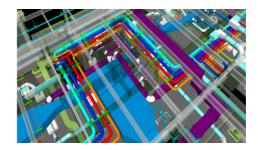
Layers

BIM

(Thomsen 2012).



شكل 8 اكتشاف الأخطاء والتداخل بين الأنظمة في



BIM شكل 7 تمثيل الأنظمة الميكانيكية في

هـ تصنيع العناصر اللازمة للإنشاء

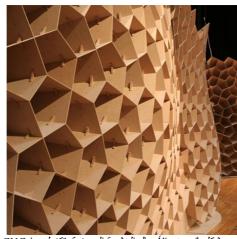
BIM

Computer CNC CNC

Numerical Control

BIM

(fastcompany.com).



شكل 9 بعض الأعمال الخشبية المصنعة بتكنولوجيا CNC

0.٣ مميزات استخدام تطبيقات BIM في العملية التصميمية

BIM CAD

: BIM Revit Autodesk

Productivity الإنتاجية ١.٥.٢

BIM CAD

% Autodesk

% %

% (Autodesk 2008) .%

Task	CAD (hours)	BIM (hours)	Hours saved	Time savings
Schematic design	190	90	100	53%
Design development	436	220	216	50%
Construction documents	1023	815	208	20%
Checking and coordination	175	16	159	91%
Totals:	1,824	1,141	683	

جدول ا مقارنة بين الوقت المطلوب لإجراء الأنشطة باستخدام CAD و

٢.٥.٣ الـسهولة Accessibility

BIM CAD CAD BIM

BIM

CAD

BIM Martinez+Cutri

.BIM

(Autodesk 2008)

٣.٥.٣ سير العمل Work Flow

BIM %

> BIM Glotman-Simpson

> > BIM

(Autodesk 2008).

CAD

Value

BIM

BIM

BIM

RTKL

(Autodesk 2008).

BIM

Risk

BIM

CAD

	BIM	%	Dona	Donald Powers	
(Autodesk .		/0		%	2008)
				ة والنتائج CAD	٤. الخلاصا •
	•	BIM	CAD		•
	·	B .CAD	IM BIM		•
				BIM	•
	BIM				
	Animation	4D 5D		BIM BIM	•
	%			BIM AD	•

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